

PATENT SPECIFICATION (11)

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(54) A TRANSPORT CONTAINER FOR RAPID FILLING AND EMPTYING

(71) We, VEREINIGTE FLUGTECHNISCHE WERKE-FOKKER G.m.b.H., of Hünefeldstrasse 1-5, 28 Bremen 1, Federal Republic of Germany, a German Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a transport container for rapid filling and emptying as may be used for example for transporting water by flying apparatus when combatting fires.

The invention seeks to create a container for transporting a liquid medium, e.g. through the air, in which this container is to be filled in a very short time with a large quantity of the liquid medium and which is to be emptied in a similarly short period of time or a longer period of time which may be controlled.

According to the invention there is provided a transport container comprising a base member, a sleeve on the base member forming a wall of the container, the sleeve and the base being relatively movable away from and towards each other to produce a gap for inflow or outflow of liquid or to close the bottom of the container respectively and means for guiding the sleeve in its relative movement to the base.

Preferably the means for guiding the sleeve comprise centring guides on the sleeve cooperating with a rod extending from the base coaxially with the sleeve. A carrying rope, cable or wire may be fixed to the upper end of the base rod, and a release rope, cable or wire may be connected to the sleeve by means of which, with the carrying rope cable or wire remaining stationary, the sleeve may be lowered to the base to produce a sealing effect between the sleeve and the base and may be raised from the base to form an annular gap of a flow of liquid therethrough.

The transport container may be fixed by means of the carrying rope, cable or wire

to a carrying hook beneath the centre of gravity of a helicopter and the release rope cable or wire of the transport container may be actuated by means of a winch located in the helicopter for the purpose of opening and closing the transport container. Thus it is possible for this container to be filled from the air in a very short time from any desired waters or from some other reservoir container by lifting the sleeve from the base sealing the container by lowering the sleeve and emptying it by raising the sleeve in a very short time over the destination. Similarly by choosing the flow cross section, the duration of emptying may be lengthened as desired. For example, the container in accordance with the invention may let out 5-7 cubic metres in approximately 1-3 seconds. The container is particularly suited to transportation by means of a helicopter. Since the weight of the container including the water acts on the carrying hook of the helicopter beneath the centre of gravity of the helicopter the risk to flight safety is eliminated. Furthermore, concentrated fire fighting can take place by means of the helicopter, since the helicopter is not subject to a minimum speed as is an ordinary aeroplane.

In a further form of the invention, safe opening and closing of the container is possible by means of the arrangement of a pneumatic cylinder. Moreover, with a double acting working cylinder, an increase may be achieved in the sealing effect between the sleeve of the container and the base. By housing the pressure supply and the control element for the pneumatic cylinder in a recess in the container for the devices it is possible to actuate and control the container independently of the support helicopter. The container is then only connected to the helicopter by the loading rope, cable or wire, and may be opened and closed by radio control from the ground. This may be of advantage particularly for directed fire fighting. In accordance with a further development of the invention the container may be used for producing and

ejecting fire extinguishing foam, with a turbulence device arranged in its flow cross section.

5 The invention will now be described in greater detail by way of example, with reference to the drawings, in which:—

Figure 1 shows the container in accordance with one embodiment of the invention in section and in a closed condition;

10 Figure 2 shows the container in accordance with the invention in side view and in open condition;

Figure 3 shows the container in accordance with the invention in a view from above;

15 Figure 4 shows a further method of sealing;

Figure 5 shows a container in accordance with another embodiment of the invention with a pressure supply from a helicopter;

20 Figure 6 shows the circuit diagram for the pressure supply of the double acting working cylinder;

25 Figure 7 shows a container in accordance with a still further embodiment of the invention with a pressure supply in the container;

Figure 8 shows a circuit diagram for radio control of a control valve in a container, and

30 Figure 9 shows a turbulence device at the base of the container.

Figure 1 shows the transport container in accordance with the invention which comprises a cylindrical sleeve 1 and the base 2 which is movable with respect to this sleeve 1. The two centring guides 4 and 5 are connected firmly to the sleeve 1 which centring guides slidably accommodate the base rod 3 in its centring openings so that the base rod, which is firmly connected to the base 2, may slide up and down in a direction perpendicular to the base and thus may open and close the container. The container is suspended from the carrying rope, cable or wire 7 which is made fast in an eye 9 of the base rod 3. Furthermore, the release rope, cable or wire 8 is connected to the sleeve 7 by means of the eyelet 10. Both ropes 7 and 8 are fixed to a helicopter which is not shown, in which the load rope engages the loading hook in the centre of gravity of the helicopter and the release rope 8 runs over a winch arranged in the helicopter. In the lower edge region of the sleeve 1 a lipped seal 6 is provided which in its closed condition ensures sealing of the base 2 with respect to the sleeve 1; this takes place for example by means of water pressure loaded on the lip which presses against the surface of the base 2 and thus brings about the required sealing action.

65 Figure 2 shows the container in accordance with the invention in the open posi-

tion in a view in which the sleeve 1 is raised with respect to the base 2 and creates an annular gap 11 through which the liquid may flow.

70 Figure 3 shows, among other things, the form of the centring guides 4 and 5.

75 Figure 4 shows a flat seal as a further advantageous form of seal, in which the flat faced end surface 12 of the sleeve 1 lies on a surface 13 of the base 2 which is also flat faced. The required sealing pressure with regard to the static pressure of the container liquid is ensured by the weight of the sleeve 1 related to the sealing surface 12.

80 The function of the container in accordance with the invention is described in the following. The helicopter flies over a suitable reservoir of water with the container in accordance with the invention fixed to it, into which the container is lowered by means of downward flight of the helicopter or by means of lowering the loading rope 7. Thus the sleeve 1 is raised with respect to the base 2 by means of the release wire 8 which is drawn up with the aid of a winch arranged in the helicopter so that the container is able to plunge into the water and be filled up. Subsequently the sleeve 1 is lowered again to the base 2 by means of the release rope 8 so that sleeve 1 and base 2 are sealed together by means of the seal 6 and form a cylindrical container. The latter is now flown over its destination, for example, a furnace, and is emptied there by raising the sleeve 1 with the aid of the release rope 8. Thus the annular gap 11 may be created as desired according to the measures to be taken for fighting the fire, so that the water flows out of the container in a longer or shorter period of time.

105 In figure 5, another embodiment of the container in accordance with the invention is shown varying from the first embodiment in its arrangement for moving the sleeve 1 relative to base 2. In order to move the sleeve 1 with respect to the base 2, a double acting pneumatic cylinder 14 is provided which, on the one hand, is connected to the base rod 3 by means of a clamping device 17 and, on the other hand, is connected to the container sleeve 1 by its piston rod 15 via a joint 16. The two pressure lines 18 and 19 lead to the helicopter as does the suspending rope 7 where a corresponding pressure supply is located 120 having a suitable control valve. The pressure tubes 18 and 19 function alternately as pressure or ventilation tubes and thus permit compulsory movement of the piston rod 15 in both directions so that, besides pneumatic opening of the container sleeve 1, 125 pneumatic closing is also possible while achieving a correspondingly increased sealing effect. The container in accordance with the first embodiment was only sealed 130

with respect to the base 2 by means of its weight.

In figure 6 the pneumatic circuit of the working cylinder 14 acted upon on both sides is shown as used in figure 5. The pressure supply 21 is housed on board the helicopter together with the control valve 20 from which the two pressure and ventilation lines 18 and 19 lead to the working cylinder 14 arranged in the container. The control valve 20 is a two position valve which may be controlled manually, for example, by the pilot of the helicopter. The left hand portion of Figure 6 shows the valve position for retraction of the piston 15, i.e. for closing the container. The compressed air from the supply 21 flows through a pressure reducing valve (not shown) through the control valve 20 and into the pressure line 19, while the air compressed by the piston 15 moves outwards through the exhaust line 18 through the control valve 20. The right hand portion of Figure 6 shows the valve position of the control valve 20 for extension of the piston rod 15, i.e. for opening the container. Thus the previous pressure line 19 has become the exhaust line, while the line 18 now carries pressure medium from the pressure supply 21 by means of the appropriate part of the valve 20.

A further variation of the container is shown in Figure 7, wherein the pressure supply 21 is arranged in a recess 22 in the container and is in the form of a pressure bottle. Above the pressure bottle 21 is located a control valve 31 which is in connection with the single acting pneumatic cylinder 30 by a pressure and exhaust line 18. In the recess 22 for the devices, moreover, a valve and a hose coupling 24 are provided for a hose connection 25 so that the container may also be filled by means of a conventional fire hose. The device recess 22 is closed by the covering flap 23, which at the same time serves as a foot plate for the container. The device recess 22 is sealed from inside against penetration by water.

In the case of radio control of the control valve 31, the required electrical components are housed in this device recess 22. This type of radio control is shown in Figure 8 in a circuit diagram in which the electronic and pneumatic part of the control may be seen. The control valve 31 is constructed as a two position valve in the case of a single acting pneumatic cylinder 30 and is triggered electromagnetically by means of an electronic circuit.

The pressure medium from the pressure bottle 21 flows through the two position valve into the pressure line 18 and lifts the piston 15 and thus the container sleeve 1, while the sleeve is lowered by gravitational

force in the second valve position of the control valve 31 and the air located in the pneumatic cylinder 30 may escape to atmosphere through the exhaust line 18 via the control valve 31. This magnetic valve 31 is triggered by a transmitter 26 located on the ground, its signals being received by the antenna located on the container and being supplied to the receiver 27. These signals are amplified by the control amplifier 28 and are switched to the magnetic valve 31 in order to open and close the container. The components 27 and 28 are supplied with electrical energy by a current source 29 arranged in the device recess 22. The magnetic valve 31 could be controlled also on board the helicopter by means of an appropriate cable, in which only current supply 29 for the magnetic valve 31 would have to be installed in the device recess 22.

Figure 9 shows a further advantageous refinement of the container in accordance with the invention for producing fire extinguishing foam when the container is filled with a mixture of water and foaming agent, in which the circumference of the base of the container 2 is encircled by a metal or plastic strip 32. This strip 32 projects with its upper part over the upper edge of the container base 2 so that a kind of fence is produced around the container base 2. The upper region of this strip 32 is provided, for example, with part circular cut-outs 33 so that the liquid escaping from the container sleeve 1 escapes in the form of individual streams. The container sleeve 1 is raised in order to produce foam by the distance 11 with respect to the upper edge of the base 2 so that the indented upper edge of the strip 32 overlaps the lower edge of the container sleeve 1. As a result of the streams of liquid produced, intensive contact between the escaping liquid and the surrounding air and thus turbulence is produced which brings about the required formation of foam. If necessary other forms of indentations may be advantageous in the metal or plastic strip 32 if in fact a lesser or greater spreading of the escaping liquid is desired.

In summary it may be established that the transport container as above described may be opened and closed safely during flight with the proposed measures, that the pressure energy supply for driving the working cylinder may itself be installed either in the helicopter or in the container, that an amplified sealing effect can be achieved in order to avoid loss due to leakage and that the opening and closing of the container both on board the helicopter—manual electromechanical or remote controlled actuation of the control valve—and remote controlled from the ground may be controlled by radio transmission. Finally, besides the

previously mentioned ejection of water by the container, fire extinguishing foam may also be produced which is advantageous for certain fire fighting conditions. Thus this container in accordance with the invention is universally suitable for rapid and safe fire fighting from the air using various extinguishing media.

10 WHAT WE CLAIM IS:—

1. A transport container comprising a base member, a sleeve on the base member forming a wall of the container, the sleeve and the base being relatively movable away from and towards each other to produce a gap for inflow or outflow of liquid or to close the bottom of the container respectively and means for guiding the sleeve in its relative movement to the base.

2. A container as claimed in claim 1, wherein the means for guiding the sleeve comprise centring guides on the sleeve co-operating with a rod extending from the base coaxially with the sleeve.

3. A container as claimed in claim 2, wherein a carrying rope, cable or wire is fixed to the upper end of the base rod and a release rope, cable or wire is connected to the sleeve by means of which, with the carrying rope, cable or wire remaining stationary, the sleeve may be lowered to the base to produce a sealing effect between the sleeve and the base and may be raised from the base to form an annular gap for flow of liquid therethrough.

4. A container as claimed in claim 3, wherein a seal, effective between sleeve and base is arranged in the base side edge region of the sleeve and is constructed as a lipped seal projecting inwards and lying on the base.

5. A container as claimed in claim 3, wherein a seal effective between the sleeve and the base is constructed as a flat seal in which the two sealing surfaces are formed by the faced end surfaces of the sleeve and the base.

6. A container as claimed in any one of claims 3 to 5, wherein a working cylinder is provided supported by the cylinder on the base rod and connected by its piston to the sleeve lowering of the sleeve to the

base being achieved by insertion of the piston rod and raising of the sleeve from base being achieved by retraction of the piston rod.

7. A container as claimed in claim 6, wherein the piston of the working cylinder is acted upon via the pressure lines on both sides or via a pressure line on one side, the pressure lines carrying a pressure medium from a pressure supply.

8. A container as claimed in claim 7, wherein the pressure supply is arranged in a device recess let into the sleeve, the device recess being sealed off from inside and being accessible from the outside by means of a covering flap.

9. A container as claimed in claim 7 and 8, wherein the working cylinder is controllable by a control valve opening or closing the pressure line or lines.

10. A container as claimed in claim 8 when appendent to claim 7, wherein the pressure supply and the control valve are arranged on board a helicopter carrying the container.

11. A container as claimed in claim 9 or 10, wherein the control valve is constructed as a magnetic valve and is controllable by a transmitter on the ground or on board by means of a receiver or control amplifier unit arranged in the container.

12. A container according to any one of claims 1 to 11, wherein the container is filled with a mixture of water and foaming agent for the purpose of producing extinguishing foam.

13. A container according to any one of claims 1 to 12 wherein turbulence devices are arranged in the region of the gap on the sleeve and/or on the base.

14. A container as claimed in claim 13, wherein the circumference of base is encased in a material strip projecting above and beyond it, in which its side projecting beyond the base has indentations.

15. A transport container substantially as described herein with reference to the drawings.

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FIG. 1

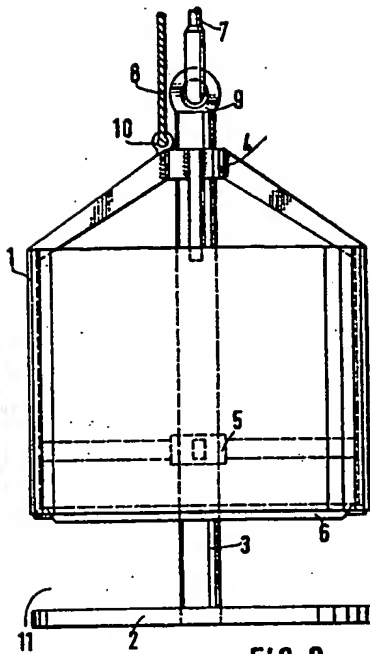
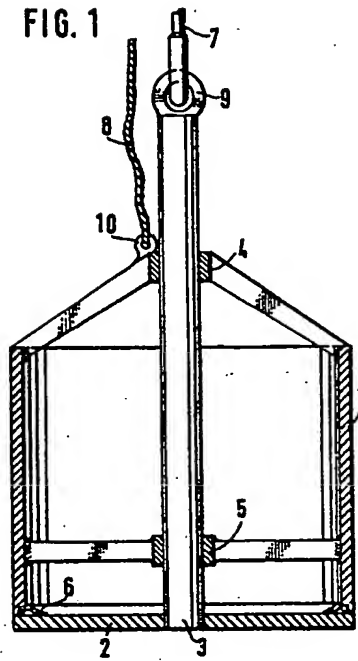


FIG. 2

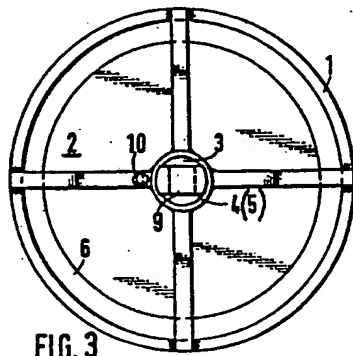


FIG. 3

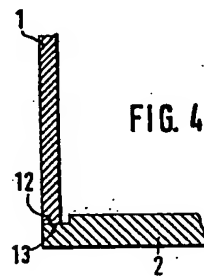


FIG. 4

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FIG. 5

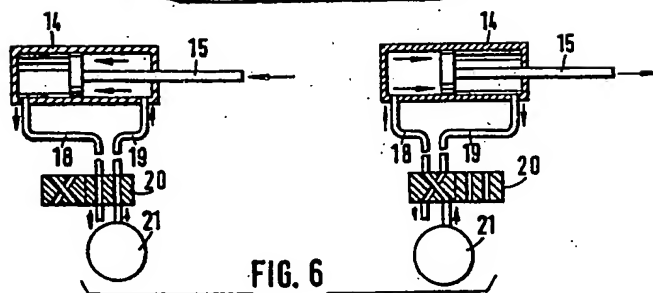
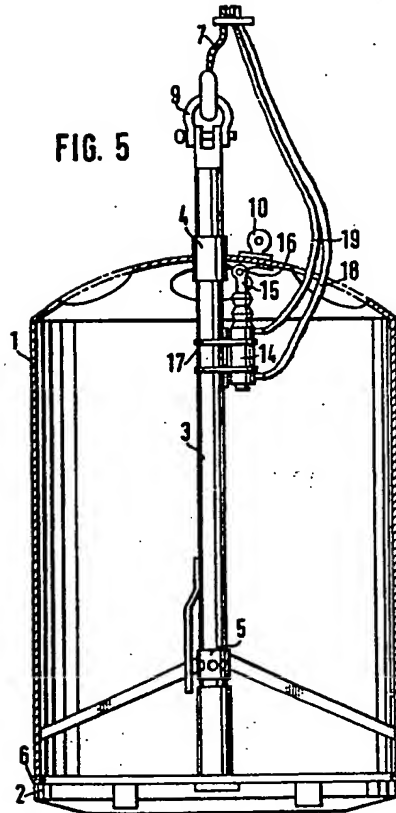


FIG. 6

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FIG. 7

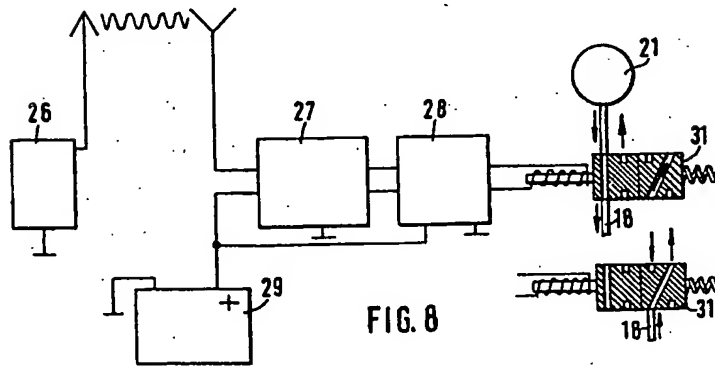
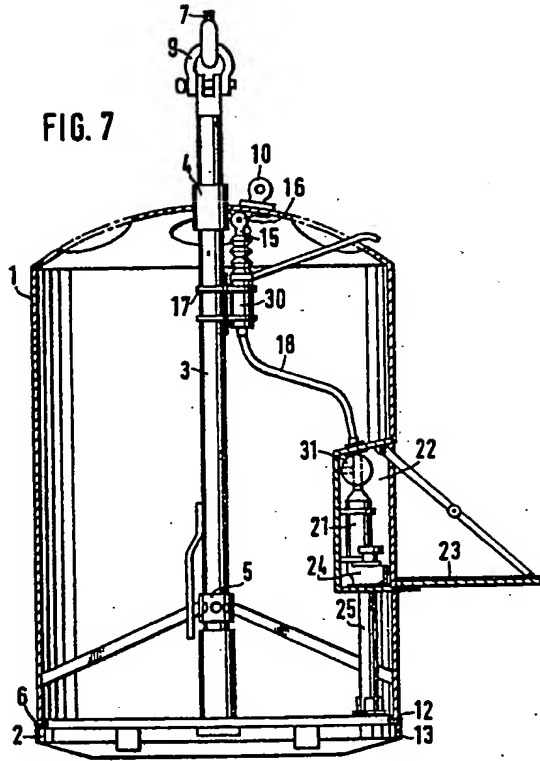


FIG. 8

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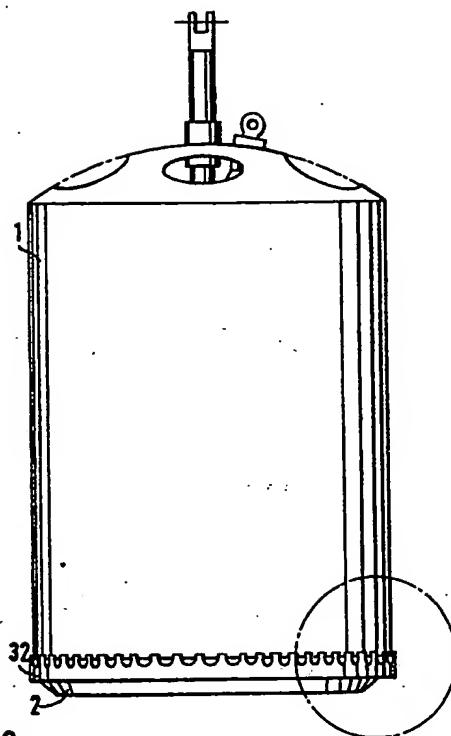
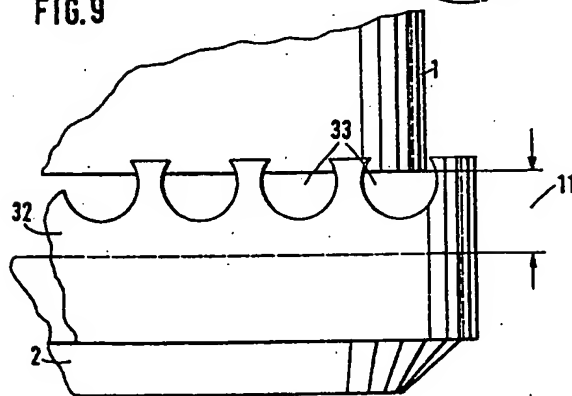


FIG. 9



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